JELLY BEAN STATISTICS

Suggested Grade
> 7

SD Mathematics Strand & Standard *(Primary for Task)*
> Statistics and Probability
>> 7.S.1.2   Students are able to display data, using frequency tables, line plots, stem-and-leaf plots, and make predications from data displayed in a graph.

Task Summary
> Students will explore the use of various ways to display and compare data.

Time and Context of Task
> Two to three forty minute class periods after the students had studied ratios, percents and frequency tables. Task was completed in student groups of 3-4.

Materials Needed
> 20 Multi-colored jelly beans or gum drops per group(I put them in small zip lock bags being sure there are several colors of jelly beans), needles, strong thread(I used embroidery thread), compass and poster paper.

Author and Lead Teacher for the Task
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**Adapted and modified from an activity in
Glencoe Applications & Connections Course 2 textbook.**

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Task Directions

Step 1: Sort the jelly beans in your bag by color. Tally this information on a frequency table.

Step 2: String the jelly beans with like colors together.

Step 3: Arrange the jelly beans in a circle. Use a compass to draw a circle the same size. (Be sure you mark the center point when you draw your circle.)

Step 4: With the jelly bean ring lined up on your circle, mark sections to indicate the separation by color.

Step 5: Draw a radius from each mark on the circle to the center.

Step 6: Identify each section by color.

Step 7: Write a paragraph or two describing the circle graph. Include a description of the sizes of the sections in relation to each other.

Step 8: Is there a relationship between the number of tally marks and the size of a section by color? If so, write a sentence to describe that relationship.

Step 9: Use the percent proportion or percent equation to find the percent represented by each color. Label each section by color and by the percent it represents.

Step 10: Explain how the ratio of each flavor to the whole is represented on the circle graph.

Step 11: The circle graph represents the same information as the frequency table. Discuss the advantages and disadvantages of each.

Present all of this information on a poster to be presented to the class.

CONTENT STANDARDS

Primary Standard
   Strand Name: Statistics and Probability
   SD Goal: Students will apply statistical methods to analyze data and explore probability for making decisions and predictions.
   Indicator: Use statistical models to gather, analyze and display data to draw conclusions.
   Standard: 7.S.1.2 Students are able to display data, using frequency tables, line plots, stem-and-leaf plots, and make predications from data displayed in a graph.

Supplemental Standard
   Strand Name: Number Sense
   SD Goal: Students will develop and use number sense to investigate the characteristics of numbers in a variety of forms and modes of operation.
   Indicator: Analyze the structural characteristics of the real number system and its various subsystems. Analyze the concept of value, magnitude, and relative magnitude of real numbers.
   Standard: 7.N.1.1. Students are able to represent numbers in a variety of forms by describing, ordering, and comparing integers, decimals, percents, and fractions.

NCTM Process Standard
   Problem Solving
   Build new mathematical knowledge through problem solving. Apply and adapt a variety of appropriate strategies to solve problems.
   Communication
   Communicate mathematical thinking coherently and clearly to peers, teachers, and others. Use the language of mathematics to express mathematical ideas precisely.

Problem-Solving Strategies
- Developing formulas and writing equations
- Drawing pictures, graphs, and tables
- Modeling
- Simplifying the problem
- Acting out the problem
- Use of manipulatives

ASSESSMENT TOOLS

Task Rubric

CATEGORY	Advanced	Proficient	Basic	Below Basic
7.S.1.2 Students are able to display data, using frequency tables, line plots, stem-and-leaf plots, and make predications from data displayed in a graph.	Explanation shows complete understanding of the mathematical concepts used to solve the rate problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the rate problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the rate problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the rate problem(s) OR is not written.
7.N.1.1. Students are able to represent numbers in a variety of forms by describing, ordering, and comparing integers, decimals, percents, and fractions	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes together.
Reflection Paper	Student presents a well written in-depth and mathematically correct interpretation of the results discovered in completing the task.	Student presents a well written and mathematically correct interpretation of the results discovered in completing the task.	Student presents a written and mostly correct interpretation of the results discovered in completing the task.	Student writing is minimal and doesn't correctly interpret the results discovered in completing the task.

Seventh Grade Statistics & Probability
Performance Descriptors

Advanced	**Seventh grade students performing at the advanced level:** • organize and represent data in various forms and use results to make predictions; • find measures of central tendency; • make predictions using theoretical probability of an independent event.
Proficient	**Seventh grade students performing at the proficient level:** • organize and represent data in various forms and make predictions from given graphs; • find measures of central tendency given a set of data; • find the probability of a simple event.
Basic	**Seventh grade students performing at the basic level:** • represent data in various forms; • find mean, mode, and range of a given set of data; • find the probability of a simple event given pictorial representation.

Seventh Grade Statistics & Probability
ELL Performance Descriptors

Proficient	**Seventh grade ELL students performing at the proficient level:** • gather, organize, and display data in graphs to solve problems; • find measures of central tendency of a given data set; • find probability of a simple event; • read, write, and speak the basic language of statistics and probability.
Intermediate	**Seventh grade ELL students performing at the intermediate level:** • represent data in various forms; • find mean, mode, and range of a given data set; • find the probability of simple events given pictorial representations; • read and answer directed questions about data in graphs; • explain in mathematical terms the sequence of steps used in solving problems; • give simple oral or written responses to directed questions on topics presented in class.
Basic	**Seventh grade ELL students performing at the basic level:** • find the probability of simple events given pictorial representations or concrete materials; • recognize and use basic statistics and probability terms; • respond to yes or no questions and to problems presented pictorially or numerically in class.
Emergent	**Seventh grade ELL students performing at the emergent level:** • copy and write statistics and probability symbols and figures; • imitate pronunciation of statistics and probability terms; • use non-verbal communication to express mathematical ideas.
Pre-emergent	**Seventh grade ELL students performing at the pre-emergent level:** • observe and model appropriate cultural and learning behaviors from peers and adults; • listen to and observe comprehensible instruction and communicate understanding non-verbally.

Individual Reflection of the Group Project

Name_____

Other Group members_____

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┊  Your thoughts on this project include what you learned, what your    ┊
┊  group did well, what you group did not do well, what you would       ┊
┊  add to or change in this project.                                    ┊
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JELLY BEAN STATISTICS
Student Work Samples

As you examine the samples, consider the following questions:

- In light of the standard/s addressed and the assessment tools provided, what evidence does the work provide that students are achieving proficiency in the knowledge and skills addressed by the standard/s for the task?

- Is the task/activity well designed to help students acquire knowledge and demonstrate proficiency? Is the task/activity clearly aligned with the standards? In what ways would you adapt the task/activity to better meet the needs of your students?

Student Work Sample #1
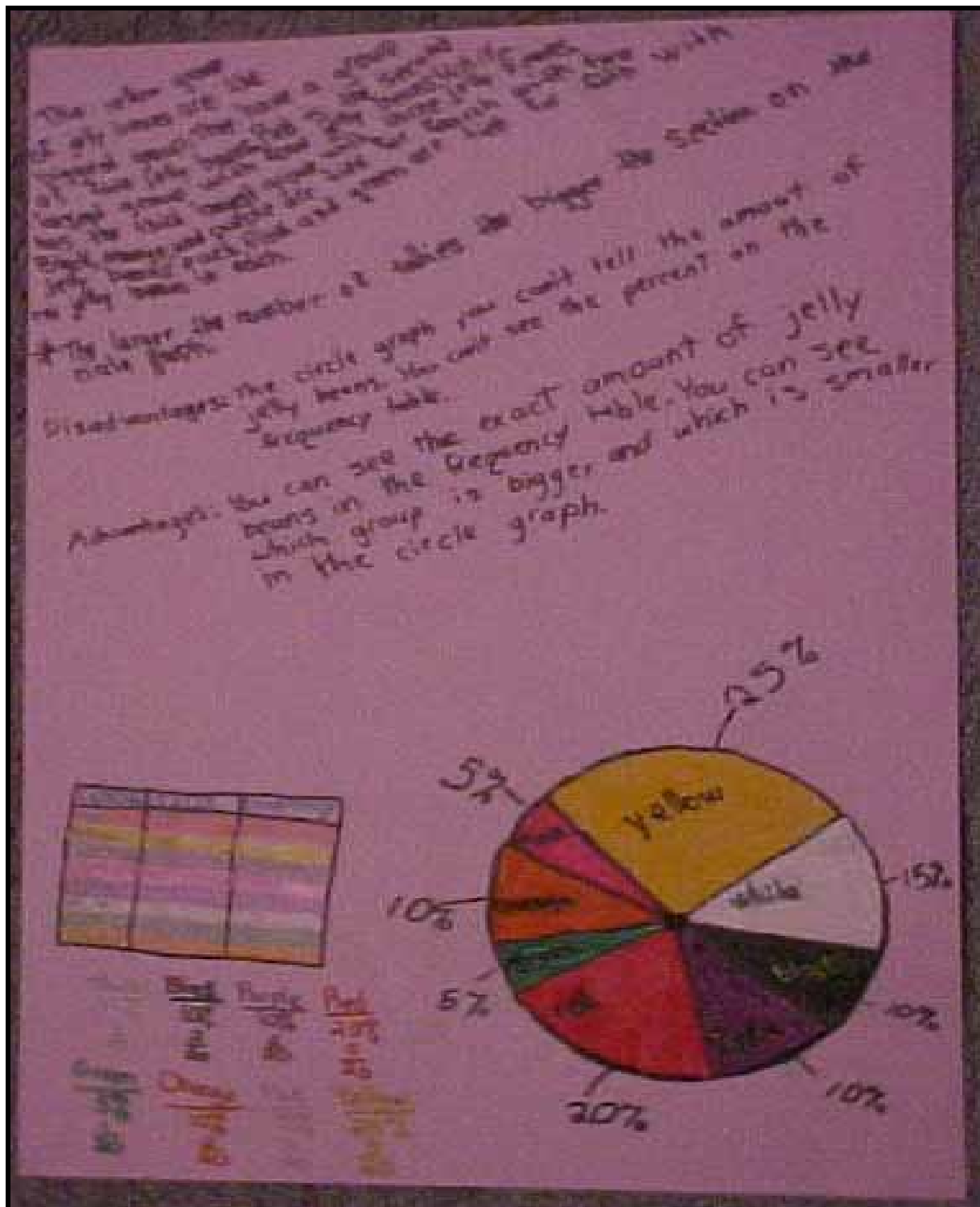
Looking at Student Work – Instructor notes and rating for work sample #1:
This work represents a proficient example. The group included all necessary components and adequately explained or displayed their processes.

Student Work Sample #2

Youe thoughts on this project include what you learned, what your group did well, what you group did not do well, what you would add to or change in this project. *use math terminology*

Our group was working together. I think we worked really well. We did steps 2, 8, 1, 3, 9, 10, 11. Everybody did a good job on every step. I made the poster. Sometime ~~[redacted]~~ was messing around. I think our paragraphs could have been better. Maybe the table could have been better too. I learned that you have a lot of team work and our table could be a little better. Int I was absent the first day so I don't know what went on that day so I really can't write about it.

Looking at Student Work – Instructor notes and rating for work sample #2:

An example of a below basic reflection paper using the rubric above. Student's writing is hard to follow and never talks about the mathematics of the task only the group dynamics which is contradicting at times. Even with the notation to use mathematical terminology, there is little evidence of it in the report.

Student Work Sample #3

> Your thoughts on this project include what you learned, what your group did _{use mathematic terminology} well, what you group did not do well, what you would add to or change in this project.
>
> I learned a lot of new things with this inventive group project. Everything that is contained in this activity I already have known how to do. But I have not learned on how to make a circle graph, or at least in this procedure. I have already known how to multiply and how to find proportions, especially in finding percents.
>
> My group performed well on this project. Eventhough Erin Voth was here for the information on the project she was not here for the remainder of the graph experiment. Everyone had a great understanding on what they were doing, they may had struggled at first, but then learned the right procedures and had no problems. The praising for this project was outstanding as well as the encourager. I don't think that there was one problem that my group did not perform well on. We all stuck together and helped each other out as much as we could. The thing that I would change in this experiment would be to add a bar graph on which was the most popular color of the jelly beans among the group and write that as a percentage as well. All in all I think that my group did and excellent job on this project.

Looking at Student Work – Instructor notes and rating for work sample #3:

An example of a proficient reflection paper using the above rubric. The student used proper mathematical terminology and their suggestions for expanding the project were appropriate and math related. The student also a good feel for how their group preformed.

INSTRUCTIONAL NOTES

Author Comments
Students enjoyed this task. I applied the principals of cooperative learning and assigned each student a role card. (Task manager, time keeper, Encourager, and Checker of Understanding) It is a good idea to have some extra jelly beans for their eating pleasure. Gum Drops or Spice Drops were easier to "sew" than jelly beans. As this was their first work with circle graphs I used 20 jelly beans per group to make it easier to find percents. Using the above rubric, 80% of their grade came from the group poster and 20% came from their individual reflection paper.

Task Extensions
The number of jelly beans can be determined by a survey of their favorite color/flavor. The amount of jelly beans used can be changed to larger, smaller or a number that would make the ratios to percents more challenging. Students could calculate the number of degrees in the central angle of each sector and use a protractor to construct the circle graph. Instead of writing a reflection paper the students could discuss or tell you their findings.

Common Strategies
Since we had used 20 jelly beans, many students discovered that each jelly bean was 5% of the whole and could easily calculate the percents mentally. Yet others divided out each ratio without finding that pattern.

Common Misunderstandings
Most students had little trouble completing the task. I think the group support was very helpful to help them clear up any misunderstandings. There were a lot of good discussions going on as students proceeded through the task. If a student had a question for me, my first response was "Have you asked everyone in your group that question?" Most times the group was able to answer their own questions.

Resources

SD Mathematics Content Standards
http://www.doe.sd.gov/contentstandards/math/index.asp
SD Assessment and Testing
http://www.doe.sd.gov/octa/assessment/index.asp
The National Assessment of Educational Progress (NAEP)
http://www.doe.sd.gov/octa/assessment/naep/index.asp
National Council of Teachers of Mathematics
http://nctm.org/
Looking at Student Work
http://www.lasw.org/index.html